M.TECH COMPUTER SCIENCE AND ENGINEERING

(DISTRIBUTED COMPUTING SYSTEMS)

(CBCS)

REGULATIONS, CURRICULUM AND SYLLABUS

(With effect from the Academic Year 2011 – 12)

PONDICHERRY UNIVERSITY

PUDUCHERRY – 605 014.

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REGULATIONS FOR POST GRADUATE (M.Tech.) PROGRAMMES IN THE DISCIPLINE OF
Computer Science and Engineering (CBCS)
(WITH EFFECT FROM JULY 2011)

M.Tech. Computer Science and Engineering (DISTRIBUTED COMPUTING SYSTEMS)

1.0 ELIGIBILITY

M.Tech. in Computer Science and Engineering (Distributed Computing Systems): Candidates for admission to the first semester of four semester M.Tech. Course in Computer Science and Engineering with specialization in Distributed Computing Systems should have passed B.E./B.Tech. in Computer Science and Engineering / Information Technology or MCA through regular course of study from an AICTE approved institution (or) an examination of any University or Authority accepted by the Pondicherry University as equivalent thereto, with at least 55% marks in the degree examination or equivalent CGPA .

Note:

1. Candidates belonging to SC/ST who have a mere pass in the qualifying examination are eligible.
2. There is no age limit for M.Tech. programmes.

2.0 ADMISSION

The admission policy for various M.Tech. programmes shall be decided by the respective institutes offering M.Tech. programmes subject to conforming to the relevant regulations of the Pondicherry University.

3.0 STRUCTURE OF M.Tech. PROGRAMME

3.1 General

3.1.1. The M.Tech. Programmes are of semester pattern with 16 weeks of instruction in a semester.

3.1.2 The programme of instruction for each stream of specialization will consist of:

(i) Core courses (Compulsory)
(ii) Electives
(iii)Laboratory
(iv)Seminar
(v) Directed Study
(vi)Project work

3.1.3 The M.Tech. Programmes are of 4 semester duration.

3.1.4. Credits will be assigned to the courses based on the following general pattern:

(i) One credit for each lecture period
(ii) One credit for each tutorial period
(iii) Two credits for practical course
(iv) Two credits for seminar
(v) Twenty three credits for Project work divided into 9 credits for Phase-I and 14 credits for Phase – II

One teaching period shall be of 60 minutes duration including 10 minutes for discussion and movement.

3.1.5 Regulations, curriculum and syllabus of the M.Tech. programme shall have the approval of Board of Studies and other Boards/ Committees/ Councils, prescribed by the Pondicherry University. The curriculum should be so drawn up that the minimum number of credits and other requirements for the successful completion of the programme will be as given in Table – 1.

Table 1: Minimum credits and other requirements

Sl.No.	Description	Requirements M.Tech (Full-Time)
1	Number of semesters	4
2	Min. number of credits of the programme	72
3	Max. number of credits of the programme	75
4	Min. Cumulative Grade Point Average for pass	5
5	Min. successful credits needed for registering in the next semester	Sem. I: 10
		Sem. II: 25
		Sem. III: 40
6	Min. period of completion of programme (consecutive semesters)	4
7	Max. period of completion of programme(consecutive semesters)	8
8	Number of core and Elective courses	12
9	Seminar	1
10	Laboratory	1
11	Directed study	1
12	Project work (semesters)	2

3.1.6 A core course is a course that a student admitted to the M.Tech. programme must successfully complete to receive the degree. A student shall register for all the core courses listed in the curriculum. Core courses in a particular specialization are offered by the department concerned.

3.1.7 Elective courses are required to be chosen from the courses offered by the department(s) in that particular semester from among the approved courses. A core course of one department may be chosen as an elective by a student from other department.

3.1.8 Each student is required to make a seminar presentation on any chosen topic connected with the field of specialization. Preparation and presentation of a seminar is intended to investigate an in-depth review of literature, prepare a critical review and develop confidence to present the material by the student. The seminar shall be evaluated by a Department Committee constituted for this purpose, based on a report submitted by the candidate and a viva-voce conducted at the end of the semester.

3.1.9 Project work is envisaged to train a student to analyze independently any problem posed to him/her. The work may be analytical, experimental, design or a combination of both. The student can undertake the project work in the department concerned or in an industry/research laboratory approved by the Chairperson/Vice-Chairperson. The project report is expected to exhibit clarity of thought and expression. The evaluation of project work will be a continuous internal assessment based on two reviews, an internal viva-voce and an external viva-voce examination.

3.1.10 Directed study is a theory course required to be credited by each student under the close supervision of a faculty member of the department. The title of the course and syllabus are to be formulated by the designated faculty member and approved by the vice-chairperson, taking into account the broad area in which the student proposes to pursue his/her project work.

3.1.11 A student who has acquired the minimum number of total credits for the award of Degree will not be permitted to register for more courses for the purpose of improving his /her cumulative grade point average (see Table 1).

3.1.12 The medium of instruction, examination, seminar, directed study and project work will be in English.

3.2 Grading

3.2.1 Based on the performance of each student in a semester, letter grades will be awarded to each course at the end of the semester. The letter grades, the corresponding grade point and the description will be as shown in Table – 2.

TABLE 2: Letter Grade and the Corresponding Grade Point

GRADE	POINTS	DESCRIPTION
S	10	EXCELLENT
A	9	VERY GOOD
B	8	GOOD
C	7	ABOVE AVERAGE
D	6	AVERAGE
E	5	SATISFACTORY
F	0	FAILURE
FA	-	FAILURE DUE TO LACK OF ATTENDANCE/ FAILURE BY ABSENCE

3.2.2 A student is deemed to have completed a course successfully and earned the appropriate credit if and only if, he /she receives a grade of E and above. The student should obtain 40% of marks in end-semester examination in a subject to earn a successful grade. A subject successfully completed cannot be repeated at any time.

3.2.3 The letter grades do not correspond to any fixed absolute mark. Each student is awarded a grade depending on his/her performance in relation to the performance of other students taking or have taken the course. For example, S does not mean he/ she has secured 100% or 95%, but, rather that he /she is in the top 5% of all the students who have taken / are taking the course, in the judgement of the teachers. Grades shall be awarded based on the absolute marks in a meeting of the M.Tech Programme Committee to be held not later than 10 days after the last day of semester examination. Normally, not more than 5% of the students in any written/ laboratory course shall be awarded the grade S and not more than one–third awarded A grade. Average marks in the class shall normally be C grade excepting in the case of practical /project where it may be B grade.

4.0 REGISTRATION

4.1 Each student, on admission, shall be assigned a Faculty Advisor, who shall advise the student about the academic programme and counsel him/her on the choice of courses depending on his/her academic background and objective.

4.2 With the advice and consent of the Faculty Advisor, the student shall register for courses he/ she plans to take for the semester before the commencement of classes. No student shall be permitted to register for courses exceeding 30 contact hours per week nor shall any student be permitted to register for any course without satisfactorily completing the prerequisites for the course, except with the permission of the teacher concerned in the prescribed format.

4.3 If the student feels that he/she has registered for more courses than he/she can handle, he/she shall have the option of dropping one or more of the courses he/she has registered for, with the consent of his/her Faculty Advisor, before the end of 3rd

week of the semester. However, a student to retain his/her status should register for a minimum of 10 credits per semester.

4.4 Students, other than newly admitted, shall register for the courses of their choice in the preceding semester by filling in the prescribed forms.

4.5 The college shall prescribe the maximum number of students in each course taking into account the physical facilities available.

4.6 The college shall make available to all students a bulletin, listing all the courses offered in every semester specifying the credits, the prerequisites, a brief description or list of topics the course intends to cover, the faculty offering the course, the time and place of the classes for the course.

4.7 In any department, preference shall be given to those students for whom the course is a core-course, if, the demand for registration is beyond the maximum permitted number of students.

4.8 Normally, no course shall be offered unless a minimum of 3 students are registered.

5.0 EVALUATION

5.1 Evaluation of theory courses shall be based on 40% continuous internal assessment and 60% end-semester examination. Evaluation of laboratory course shall be based on 50% internal assessment and 50% end-semester examination. In each course, there shall be a 3 hour end-semester examination.

5.2 The seminar will be evaluated internally for 100 marks. The total marks for the project work will be 300 marks for phase-I and 400 marks for phase-II. The allotment of marks for external valuation and internal valuation shall be as detailed below:

Seminar(Internal valuation only):100 Marks

First review		30 marks
Second review		30 marks
Report and Viva voce		40 marks
	Total	**100 marks**

Project work – (Phase – I): 300 Marks

Internal valuation			
	Guide		50 marks
	First Evaluation		50 marks
	Second Evaluation		50 marks
		Total	**150 marks**
External valuation			

	Evaluation (External Examiner Only)		50 marks
	Viva voce (50 for Ext. + 50 for Int.)		100 marks
		Total	**150 marks**

Project work – (Phase – II): 400 Marks

Internal valuation			
	Guide		100 marks
	First Evaluation		50 marks
	Second Evaluation		50 marks
		Total	**200 marks**
External valuation			
	Evaluation (External Examiner Only)		50 marks
	Viva voce (75 for Ext. + 75 for Int.)		150 marks
		Total	**200 marks**

Internal valuation should be done by a committee comprising of not less than 3 faculty members appointed by the Vice-Chairperson.

5.3 The directed study shall be evaluated internally and continuously as detailed below:

Test I	: 15 Marks
Test II	: 15 Marks
Assignment	: 10 Marks
Final test covering the whole syllabus	: 60 Marks
Total	: 100 Marks

5.4 The end-semester examination shall be conducted by the department for all the courses offered by the department. Each teacher shall, in the 4th week of the semester, submit to the Vice-Chairperson, a model question paper for the end-semester examination. The end-semester paper shall cover the entire course.

5.5 The department shall invite 2 or 3 external experts for evaluating the end-semester examinations and grading. Each expert will be asked to set the question paper(s) for the course(s) he/she is competent to examine for the end-semester examination based on the model question paper submitted by the teacher concerned. The teacher and the expert concerned shall evaluate the answer scripts together and award the marks to the student. If, for any reason, no external expert is available for any paper, then, the teacher concerned shall set the question paper(s) for the end-semester examination, and the teacher himself/herself shall evaluate the papers and award the marks.

5.6 In the department, after the evaluation of the end-semester examination papers, all the teachers who handled the courses and the external experts together shall meet

with the M.Tech. Programme Committee (see 7.0) and decide the cut-offs for grades in each of the courses and award the final grades to the students.

5.7 Continuous internal assessment mark of 40 for a theory course shall be based on two tests (15 marks each) and one assignment (10 marks). A laboratory course carries an internal assessment mark of 50 distributed as follows: (i) Regular laboratory exercises and records – 20 marks (ii) Internal laboratory test – 20 marks and (iii) Internal viva-voce – 10 marks.

5.8 Every student shall have the right to scrutinize his/her answer scripts, assignments etc. and seek clarifications from the teacher regarding his/her evaluation of the scripts immediately after or within 3 days of receiving the evaluated scripts.

5.9 The department shall send all records of evaluation, including internal assessment for safe-keeping, to the college administration, as soon as all the formalities are completed.

5.10 At the end of the semester, each student shall be assigned a grade based on his/ her performance in each subject, in relation to the performance of other students.

5.11 A student securing F grade in a core course must repeat that course in order to obtain the Degree. A student securing F grade in an elective course may be permitted to choose another elective against the failed elective course, as the case may be, in consultation with the Faculty Adviser.

5.12 A student shall not be permitted to repeat any course(s) only for the purpose of improving the grade in a particular course or the cumulative grade point average (CGPA).

5.13 In exceptional cases, with the approval of the Chairperson, PG Programme committee, make–up examination(s) can be conducted to a student who misses end-semester examination(s) due to extreme medical emergency, certified by the college Medical Officer, or due to time-table clash in the end-semester examination between two courses he/she has registered for, in that semester.

5.14 All eligible students shall appear for end-semester examinations.

5.15 No student who has less than 75% attendance in any course will be permitted to attend the end-semester examinations. However, a student who has put in 60-75% attendance in any course and has absented on medical grounds will have to pay a condonation fee of Rs.200/- for each course and produce a medical certificate from a Government Medical Officer not below the rank of R.M.O. or officer of equal grade to become eligible to appear for the examinations. A student with less

than 60% attendance shall be given the grade of FA. He/ She shall have to repeat that course if it is a core course, when it is offered the next time.

6.0 SUMMER TERM COURSE

6.1 A summer term course (STC) may be offered by the department concerned on the recommendations of M.Tech. Programme Committee. A summer term course is open only to those students who had registered for the course earlier and failed. No student should register for more than two courses during a summer term. Those students who could not appear for examination due to lack of attendance will not be allowed to register for the same course offered in summer, unless, certified by the Vice-Chairperson concerned and the Principal.

6.2 Summer term course will be announced at the end of even semester. A student has to register within the stipulated time by paying the prescribed fees.

6.3 The number of contact hours per week for any summer term course will be twice that of a regular semester course. The assessment procedure in a summer term course will be similar to the procedure for a regular semester course.

6.4 Withdrawal from a summer term course is not permitted.

7.0 M.Tech. PROGRAMME COMMITTEE

7.1 Every M.Tech. Programme shall be monitored by a committee constituted for this purpose by the college. Each committee shall consist of all teachers offering the courses for the programme and two student members or 10% of students enrolled whichever is less. The HOD or a senior faculty in the rank of a Professor shall be the Vice-Chairperson, nominated by the Head of the Institution. There shall be a common Chairperson in the Rank of Professor nominated by the Head of the Institution for all the P.G. programmes offered by the institute. There can be a common coordinator in the rank of Professor nominated by the Head of the Institution.

7.2 It shall be the duty and responsibility of the committee to review periodically the progress of the courses in the programme, discuss the problems concerning the curriculum and syllabi and conduct of classes. The committee may frame relevant rules for the conduct of evaluation.

7.3 The committee shall have the right to make suggestions to individual teachers on the assessment procedure to be followed for his/her course. It shall be open to the committee to bring to the notice of the Head of the Institution any difficulty encountered in the conduct of the classes or any other pertinent matter.

7.4 The committee shall meet at least twice a semester – first at the beginning of the semester, and second at the end of the semester. In the second meeting, the committee excluding student members but with the external experts invited by the Chairperson PG Programme Committee, shall finalize the grades of the students.

8.0 MINIMUM REQUIREMENTS

8.1 To be eligible towards continuing the Programme, a student must have earned a certain number of successful credits at the end of each semester as given in Table – 1. If he /she fails to satisfy this criterion in any semester, he/she shall be placed on scholastic probation in the succeeding semester. If he/she fails to earn the number of credits by the end of that year (including courses taken in summer), then, he/she shall be asked to discontinue the Programme.

8.2 Students are expected to abide by all the rules of the college and maintain a decorous conduct. Any deviation will be referred to the Head of the Institution for suitable action.

8.3 No student who has any outstanding dues to the college, hostel, library or laboratory or against whom any disciplinary action is contemplated/ pending, will be eligible to receive his/her degree.

9.0 DECLARATION OF RESULTS,RANK AND ISSUE OF GRADE CARD

9.1 The PG Programme(CBCS) office shall display the grades as soon as possible after the finalization of the grades. The student shall have the right, for a look at the evaluated examination scripts and represent to the M.Tech. Programme Committee for review if he/she feels aggrieved by the evaluation within a week from the commencement of succeeding semester classes.

9.2 The College shall issue at the beginning of each semester a grade card to the student, containing the grades obtained by the student in the previous semester (s) and his/her Grade Point Average (GPA) and his/her Cumulative Grade Point Average (CGPA).

9.3 The grade card shall list:

a) title of the course(s) taken by the student.
b) credits associated with each course.
c) grade secured by the student.
d) total credits earned by the student in that semester.
e) GPA of the student.
f) total credits earned by the student till that semester and
g) CGPA of the student.

9.4 The GPA shall be calculated as the weighted average of the Grade Points weighted by the credit of the course as follows:

The product of the credit assigned to each course and the grade point associated with the grade obtained in the course is totaled over all the courses and the total is divided by the sum of credits of all the courses and rounded off to two decimal places.

For example, a student securing grade A in a 4 credit course, grade B in a 2 credit course, grade S in a 3 credit course and grade F in a 3 credit course, will have a GPA as:

(9 x 4 + 8 x 2 + 10 x 3 + 0 x 3)/ (4+2+3+3) =82 /12=6.83/10.0

The sum will cover all the courses the student has taken in that semester, including those in which he/she has secured grade F. Grades FA are to be excluded for calculating GPA and CGPA.

9.5 For computing CGPA, the procedure described in 9.4 is followed, except, that the sum is taken over all the courses the student has studied in all the semesters till then. If a student has repeated any course, the grade secured by him/her in the successful attempt only will be taken into account for calculating CGPA.

9.6 To convert CGPA into percentage marks, the following formula shall be used:

% Mark = (CGPA - 0.5) ×10

9.7 A candidate who satisfies the course requirements for all semesters and passes all the examinations prescribed for all the four semesters within a maximum period of 10 semesters reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of degree.

9.8 A candidate who qualifies for the award of the degree shall be declared to have passed the examination in **FIRST CLASS with DISTINCTION** upon fulfilling the following requirements:

Should have passed all the subjects pertaining to semesters 1 to 4 in his/her first appearance in 4 consecutive semesters starting from first semester to which the candidate was admitted.

Should not have been prevented from writing examinations due to lack of attendance should have secured a CGPA of 8.50 and above for the semesters 1 to 4.

9.9 A candidate who qualifies for the award of the degree by passing all the subjects relating to semesters 1 to 4 within a maximum period of 6 consecutive semesters after his/her commencement of study in the first semester and in addition secures CGPA not less than 6.5 shall be declared to have passed the examination in **FIRST CLASS**.

9.10 All other candidates who qualify for the award of degree shall be declared to have passed the examination in **SECOND CLASS**.

9.11 A student with CGPA less than 5.0 is not eligible for the award of degree.

9.12 For the award of University rank and gold medal, the CGPA secured from 1st to 4th semester should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 4th semester in the first appearance and he/she should not have been prevented from writing the examination due to lack of attendance and should not have withdrawn from writing the end-semester examinations.

10.0 PROVISION FOR WITHDRAWAL

A candidate may, for valid reasons, and on the recommendation of the vice-chairperson and chairperson be granted permission by the Head of the Institution to withdraw from writing the entire semester examination as one unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire programme. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank/ gold medal.

11.0 TEMPORARY DISCONTINUATION FROM THE PROGRAMME

If a candidate wishes to temporarily discontinue the programme for valid reasons, he/she shall apply to the Chairperson, PG Programme committee, through the Head of the department in advance and secure a written permission to that effect. A candidate after temporary discontinuance may rejoin the programme only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees. The total period of completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 8 consecutive semesters including the period of discontinuance.

12.0 POWER TO MODIFY

12.1 Notwithstanding anything contained in the foregoing, the Pondicherry University shall have the power to issue directions/ orders to remove any difficulty.

12.2 Nothing in the foregoing may be construed as limiting the power of the Pondicherry University to amend, modify or repeal any or all of the above.

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M.TECH COMPUTER SCIENCE AND ENGINEERING
(Distributed Computing Systems)

CURRICULUM AND SCHEME OF EXAMINATION

(Total number of credits required for the completion of the programme: 72)

SEMESTER – I

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.		CORE - I	3	1	0	4	40	60	100
2.		CORE - II	3	1	0	4	40	60	100
3.		CORE - III	3	1	0	4	40	60	100
4.		Elective – I	3	0	0	3	40	60	100
5.		Elective – II	3	0	0	3	40	60	100
6.		Elective – III	3	0	0	3	40	60	100
7.	CS 941	Seminar / Laboratory – I	-	-	3	2	100	-	100
						23	340	360	700

SEMESTER – II

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.		CORE - IV	3	1	0	4	40	60	100
2.		CORE - V	3	1	0	4	40	60	100
3.		CORE - VI	3	1	0	4	40	60	100
4.		Elective – IV	3	0	0	3	40	60	100
5.		Elective –V	3	0	0	3	40	60	100
6.		Elective – VI	3	0	0	3	40	60	100
7.	CS 942	Laboratory - II	-	-	3	2	50	50	100
						23	290	410	700

SEMESTER – III

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	CS 943	Project Phase-I	-	-	16	9	150	150	300
2.	CS 944	Directed Study	-	-	3	3	100	-	100
						12	250	150	400

SEMESTER – IV

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	CS 945	Project Phase II	-	-	24	14	200	200	400
						14	200	200	400

LIST OF CORE SUBJECTS

CS901 DESIGN OF DISTRIBUTED SYSTEMS

CS902 INFRASTRUCTURE FOR DISTRIBUTED SYSTEMS

CS903 ADVANCES IN DATABASE SYSTEMS

CS904 HIGH PERFORMANCE NETWORKS

CS905 CLOUD AND UTILITY COMPUTING

CS906 NETWORK MANAGEMENT AND SECURITY

LIST OF ELECTIVE SUBJECTS:

CS911	ADVANCED COMPUTER ARCITECTURE
CS912	EVOLUTIONARY COMPUTING
CS913	MOBILE COMPUTING
CS914	INTELLIGENT INFORMATION RETRIEVAL
CS915	REAL-TIME SYSTEMS
CS916	WEB SERVICES AND INTERNET ENGINEERING
CS917	MACHINE LEARNING
CS918	DATA COMPRESSION
CS919	AGENT TECHNOLOGY
CS920	ADVANCED JAVA PROGRAMMING
CS921	OPTICAL COMMUNICATION NETWORKS
CS922	SOFTWARE ARCHITECTURE
CS923	ADVANCES IN SOFTWARE ENGINEERING
CS924	SYSTEMS PERFORMANCE EVALUATIONS
CS925	DISTRIBUTED ALGORITHMS
CS926	DATA MINING AND DATA WARE HOUSING
CS927	MULICORE ARCHITECTURE AND PROGRAMMING
CS928	AD HOC AND SENSOR NETWORKS
CS929	REINFORCEMENT LEARNING
CS930	DESIGN OF EMBEDDED SYSTEMS
CS931	SERVICE ORIENTED ARCHITECTURE
CS932	DISTRIBUTED SYSTEM SECURITY
CS933	TRUSTED INTERNET
CS934	ETHICAL HACKING

CS 901 DESIGN OF DISTRIBUTED SYSTEMS

UNIT - I

Introduction – Examples of Distributed Systems – Resource Sharing and the Web – Challenges- System Models - Introduction – Architectural Models – Functional Models- Characterization of Distributed Systems – Client-Server Communication – Distributed Objects and Remote Invocation – Communication Between Distributed Objects – Remote Procedure Call – Events and Notifications.

UNIT - II

Distributed Operating Systems - Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non-Token Based Algorithms – Lamport's Algorithm - Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols – Classification - Solutions –Applications.

UNIT- III

Distributed Resource Management - Distributed File systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols - Design Issues. Distributed Scheduling – Issues – Components – Algorithms.

UNIT- IV

Introduction to Distributed Algorithms, Kinds of Distributed Algorithm, Timing Models. Synchronous Network Algorithms: Synchronous Network Model, Leader Election in a synchronous Ring, Algorithms in a General Synchronous Networks, Distributed Consensus with Link Failures, Distributed Consensus with Process failures, More Consensus problems.

UNIT-V

Resource Security and Protection **-** Introduction – The Access Matrix Model – Implementation of Access Matrix Model – Safety in the Access Matrix Model – Advanced Models of protection – Data Security.

REFERENCES

1. George Coulouris, Jean Dellimore and Tim KIndberg, "Distributed Systems Concepts and Design", Pearson Education, 4th Edition, 2005 [Unit-I]
2. Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems",
3. McGraw-Hill, 2001 [Units II - IV]
4. Joshy Joseph and Craig Fellenstein, "Grid Computing", IBM Press, 2004. [Unit –V]
5. Ajay D. Kshemkalyani and Mukesh Singhal, " Distributed Computing – Principles,
6. Algorithms and Systems", Cambridge University Press, 2008.
7. Pradeep K. Sinha, Distributed Operating Systems, PHI, 2005.
8. Nancy A. Lynch, Distributed Algorithms, Morgan Kaufmann Publishers, 2000.

CS902 DESIGN OF DISTRIBUTED SYSTEMS INFRASTRUCTURE

UNIT-I

Introduction to Client/Server Computing - Client/Server Building Blocks - The Road to Bandwidth.

Clients, Servers, and Operating Systems - Commercial OS - Comparison of OS

UNIT-II

Base Middleware: Stacks and NOSs -NOS: Creating the Single-System Image - RPC, Messaging, and Peer-to-Peer - NOS: existing commercial and open source solutions.

SQL Database Servers :- SQL Database Servers - SQL Middleware and Federated Databases - Data Warehouses: Information source - EIS/DSS: From Queries, To OLAP, to Data Mining - existing commercial and open source solutions

UNIT-III

Client/Server Transaction Processing : The basics of Transactions - TP Monitors: Managing Client/Server Transactions - TP-Lite or TP-Heavy - TP Monitors - existing commercial and open source solutions.

Client/Server Groupware: Client/Server Groupware - Groupware: existing commercial and open source solutions

UNIT-IV

Client/Server With Distributed Objects: Distributed Objects and Components- CORBA: From ORBs To Enterprise Beans - COM+: The Other Component Bus - Object Databases - Distributed Objects: existing commercial and open source solutions

Client/Server and the Internet: The Hypertext Era - Web Client/Server: The Interactive Era - Web Client/Server: The Distributed Object Era - Web Client/Server: existing commercial and open source solutions

UNIT-V

Distributed System Management - Client/Server Distributed System Management - Distributed System Management Standards

Bringing It All Together - Client/Server Tools and Application Development - Future Directions

REFERENCES

1. Robert Orfali, Dan Harkey and Jeri Edwards, “Client/server Survival Guide”, 3rd Edition, Wiley India Pvt Ltd, 2007.
2. Gupta, “IT Infrastructure And Its Management”, Tata Mcgraw Hill Publishing Company Limited 2009.

CS903 ADVANCES IN DATABASE SYSTEMS

UNIT – I

Overview of Existing DBMS Models- Introduction to commercial and open source database systems- Need for Special databases like multimedia, embedded, web, spataila, temporal databases-JDBC-ODBC.

UNIT – II

Query Processing basics and optimization – Heuristic Optimization – Cost, Size Estimation - Models of Transactions – Properties of Transactions – Concurrency Control – Recovery – Security and Authorization – Storage – Indexing and Hashing – ISAM – B-Trees – Kd Trees – X Trees – Dynamic Hashing.

UNIT – III

Distributed Databases – Principles – Design – Queries – Translation of Queries – Optimization Access Strategies – Management of Distributed Transactions – Concurrency Control – Reliability

UNIT – IV

Object Oriented Concepts – Data Object Models – Object Based Databases – Object Oriented Databases – Persistence – Issues in OODBMS - Object Oriented Relational Databases – Object Definition Languages – Object Query Languages – SQL3 - Concurrency in OODBs – Storage and Access – Data Access Interface Technologies – ADO – RDO - CORBA.

UNIT – V

Enhanced data models for Advanced applications - Multimedia Databases – Parallel Databases – Data Mining – Data warehousing – Spatial Database Concepts – Temporal Database Concepts – Active Databases -.Embedded databases-Web databases – The Web as a database application platform – Scripting Language: PHP and Ruby

REFERENCES

1. Abraham Silberchatz, Henry F. Korth, and S.Sudarsan, “Database System Concepts”, 5th Edition, McGraw-Hill, 2006.
2. Ramez Elmasri & Shamkant B. Navethe, “Fundamentals of Database Systems”, 4th Edition, Pearson Education, 2004.
3. Thomas M. Connolly and Carolyn E. Begg, “Database Systems – A Practical Approach to Design, Implementation and Management”, 3rd edition, Pearson Education, 2003.
4. Jefrey D. Ullman and Jenifer Widom, “A First Course in Database Systems”, Pearson Education Asia, 2001.
5. Stefano Ceri, Giuseppe Pelagatti, “Distributed Databases Principles and Systems”, McGraw-Hill International Editions, 1985.
6. Rajesh Narang, “Object Oriented Interfaces and Databases”, Prentice Hall of India, 2002.

CS904 HIGH PERFORMANCE NETWORKS

UNIT- I

Introduction to computer networks - Review of OSI/ISO model – Introduction to high speed networks - High speed LANs – Fast Ethernet - Switched Fast Ethernet - Gigabit Ethernet – ISDN, FDDI, Frame relay - operations and layers.

UNIT- II

Introduction to SONET – SONET/SDH Layers – SONET Frame Structure – Sonet Physical Layer. Introduction ATM – Cell format and Switching Principles – Protocol Architecture – Service categories. TCP/IP protocol Suite – IP Packet Header – TCP packet header – User services – Protocol Operation – Connection Establishment – UDP.

UNIT- III

Congestion control in Data Networks and Internets – Effects of Congestion – Congestion Control in Packet Switched Networks. Frame relay Congestion Control – Traffic rate Management – Congestion Avoidance. ATM Traffic and Congestion Control – Attributes – Traffic Management Framework – Traffic Control – ABR Traffic Management. TCP Traffic Control – Flow Control – TCP Congestion Control – Timer Management – Window Management.

UNIT-IV

Introduction to Quality of Service - Integrated Services – Differentiated Services – Protocols for QoS support - Resource Reservation (RSVP) – Multiprotocol Label Switching (MPLS) – Real-Time Transport Protocol (RTP).

UNIT- V

Introduction to Optical networks – Wavelength division multiplexing (WDM) – Introduction to broadcast-and-select networks - Switch architectures - channel accessing – Wavelength routed networks – Switch architectures - Routing and wavelength assignment – virtual topology design– IP over SONET over ATM over WDM – IP over ATM over WDM – IP over WDM.

REFERENCES

1. William Stallings,"High-Speed Networks and Internets", 2nd Edition, Pearson Education, 2002. (Unit I, II, III, and IV)
2. Fred Halsall,"Multimedia Communications: Applications, Protocols, and Standards", Pearson Education Asia, 2001. (Unit I and II)
3. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks: A Practical Perspective", 2nd Edition, Morgan Kaufmann (Elsevier Indian Edition), 2004. (Unit II and V).
4. C. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks: Concepts, Design, and Algorithms", PHI, 2002. (Unit V)
5. Laon-Garcia and Widjaja,"Communication Networks: Fundamental Concepts and key Architectures, Tata McGrawHill, 2000.

6. Behrouz A. Forouzan, "Data Communications and Networking", 2nd Edition, Tata McGraw-Hill, 2000.

CS905 CLOUD AND UTILITY COMPUTING

UNIT-I

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network

UNIT-II

Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing

UNIT –III

Introduction - Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups - Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language – Interoperability Standards for Data Center Management - Utility Computing Technology – Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment - Data Center Challenges and Solutions - Automating the Data Center

UNIT-IV

Software Utility Application Architecture - Characteristics of an SaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework - Common Enablers – Conceptual view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture

UNIT-V

Other Design Considerations - Design of a Web Services Metering Interface - Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program - Business Model Scenarios - Virtual Services for Organizations - The Future.

REFERENCES

1. John W. Rittinghouse and ames F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London New York. 2010 [Unit -11 and Unit II]
2. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007 . [Unit -11I to Unit V]
3. Guy Bunker and Darren Thomson, "Delivering Utility Computing", John Wiley & Sons Ltd, 2006.

4. George Reese, "Cloud Application Architectures", O'reilly Publications, 2009.

CS906 NETWORK MANAGEMENT AND SECURITY

UNIT-I

Introduction: Codes and Ciphers – Some Classifiable systems – Statistical theory of cipher systems-Complexity theory of crypto systems – Stream ciphers, Block ciphers.

UNIT-II

Stream Ciphers: Rotor based system – shift register based systems – Design considerations for stream ciphers – Cryptanalysis of stream ciphers – Combined encryption and encoding. Block Ciphers – DES and variant, modes of use of DES. Public key systems – Knack sack systems – RSK – Diffie Hellman Exchange – Authentication and Digital signatures, Elliptic curve based systems.

UNIT-III

System Identification and clustering: Cryptology of speech signals – narrow band and wide band systems – Analogue & Digital Systems of speech encryption.

UNIT-IV

Security: Hash function – Authentication: Protocols – Digital Signature standards. Electronics Mail Security – PGP (Pretty Good Privacy) MIME, data Compression technique. IP Security: Architecture, Authentication Leader, Encapsulating security Payload – Key Management. Web security: Secure Socket Layer & Transport Layer security, secure electronics transactions. Firewalls Design principle, established systems.

UNIT-V

Telecommunication Network Architecture, TMN management layers, Management information Model, Management servicing and functions, Structure of management information and TMN information model, SNMP v1, SNMP2 & SNMP3, RMON1 & 2, Broadband Network Management (ATM, HFC, DSL), ASN

REFERENCES

1. Upper Saddle River ,"Cryptography and Network Security: Principal & Practices", 2nd Edition, PHI
2. Subramanian and Mani,"Network Management Principles & Practices", AWL.
3. Wllam Stallings," SNMP: A Guide to Network Management ", MGH.
4. H.H.Wang,"Telecom Network Management", MGH

5. U.Dlack,"Network Management", MGH

CS911 ADVANCED COMPUTER ARCHITECTURE

UNIT – I

Parallel Computer Models - The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks. Program and Network properties - Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow mechanisms, System Interconnection Architectures.

UNIT – II

Principles of Scalable Performance - Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches. Processor and Memory Hierarchy - Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT – III

Bus, Cache, and Shared Memory - Backplane Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models. Pipelining and Superscalar Techniques - Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, superscalar and Superpipeline Design.

UNIT – IV

Multiprocessors and Multicomputers - Multiprocessor System Interconnects, Cache Coherence and Synchronization mechanisms, Three Generations of Multicomputers, Message-Passing Mechanisms. Multivector and SIMD Computers - Vector Processing Principles, Multivector Multiprocessors, Compound Vector Processing, SIMD Computer organizations, The Connection Machine CM-5. Scalable, Multithreaded, and Dataflow Architect architectures - latency-Hiding Techniqies, Principles of Multithreading, Fine-Grain Multicomputers. Scalable and Multithreaded Architectures, Dataflow and Hybrid Architectures.

UNIT – V

Parallel Models, Languages and Compilers - Parallel Programming Models, Parallel Languages and Compilers. Dependence Analysis of Data Arrays, Code Optimization and Scheduling, Loop Parallellization and Pipelining. Parallel Program Development and Environments - Parallel programming Environments, Synchronization and Multiprocessing Models, Shared-Variable Program Structures, Message-Passing program Development, Mapping Programs onto Multicomputers.

REFERENCES

1. Kai Hwang ,"Advanced Computer Architecture: Parallelism, Scalability, Programmability", Tata McGraw-Hill, 2003.

2. Kai Hwang and Faye A. Briggs," Computer Architecture and Parallel Processing", McGraw-Hill International Editions, 1985.

CS 912 EVOLUTIONARY COMPUTING

UNIT – I

INTRODUCTION TO EVOLUTIONARY COMPUTATION: Biological and artificial evolution - Evolutionary computation and AI – Different historical branches of EC-GAs- EP-ES- GP - A simple evolutionary algorithm.

UNIT- II

SEARCH AND SELECTION OPERATORS: Recombination/Crossover for strings- one-point- multi-point-uniform crossover operators - Mutation for strings- bit-flipping - Recombination/Crossover and mutation rates - Recombination for real-valued representations- Fitness proportional selection and fitness scaling – Ranking methods – Tournament selection.

UNIT – III

EVOLUTIONARY COMBINATORIAL OPTIMIZATION: Case study on GA applications (Traveling salesman problem, Time tabling problem, Job scheduling problem) Hybrid evolutionary and local search algorithm. Convergence of EAs - Computational time complexity of EAs - No free lunch theorem.

UNIT – IV

CONSTRAINT HANDLING: Common techniques- penalty methods- repair methods - Analysis –Some examples. Pareto optimality - Multiobjective evolutionary algorithms.

UNIT – V

GENETIC PROGRAMMING: Trees as individuals - Major steps of genetic programming-, functional and terminal sets- initialization- crossover-mutation- fitness evaluation – Search operators on trees – Examples.

Introduction to parallel genetic programming, Distributed genetic programming. Case study on GP applications (symbolic regression, multiplexer, artificial ant)

REFERENCES:

1. Goldberg and David E, "Genetic Algorithms in Search. Optimization and Machine Learning", Pearson Education, New Delhi, 1989.
2. Kalyamoy Deb, "Multiobjective Optimization using Evolutionary Algorithms", John Wiley & Sons, USA, 2003.
3. Koza, John, Wolfgang Banzhaf, Kumar Chellapilla, Kalyanmoy Deb, Marco Dorigo, David Fogel, Max Garzon, David Goldberg, Hitoshi Iba, and Rick Riolo(Eds.), "Genetic Programming", Academic Press. Morgan Kaufmann, USA, 1998.

4. John R.Koza, Forrest H Bennett III , David Andre and Martin A Keane, "Genetic Programming III: Darwinian Invention and Problem Solving" Morgan Kaufmann, USA, 1999.

CS913 MOBILE COMPUTING

UNIT - I

Mobile communication- Mobile computing- Mobile computing architecture -Mobile devices- Mobile system networks - Data dissemination- Mobility management-Mobile phones- Digital Music Players- Handheld Pocket Computers-Handheld Devices, Operating Systems- Smart Systems- Limitations of Mobile Devices- Automotive Systems.GSM and Similar Architectures **-** GSM – Services and System Architectures, Radio Interfaces, Protocols, Localization, Calling, Handover, General Packet Radio Service, High-speed circuit-switched data, DECT.

UNIT – II

Wireless Medium Access Control and CDMA – based Communication -Medium Access Control- Introduction to CDMA – based Systems-OFDM. Mobile IP Network Layer **-** IP and Mobile IP Network Layers Packet Delivery and Handover Management- Registration- Tunneling and Encapsulation- Route Optimization-Dynamic Host Configuration Protocol. Mobile Transport Layer **-** Indirect TCP- Snooping TCP- Mobile TCP- Other Methods of TCP – layer Transmission for Mobile Networks.

UNIT - III

Databases **-** Database Hoarding Techniques, Data Caching- Client – Server Computing and Adaptation- Transactional Models- Query Processing- Data Recovery Process, Issues relating to Quality of Service. Data Dissemination and Broadcasting Systems **-** Communication Asymmetry, Classification of Data – Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Techniques- Digital Audio Broadcasting- Digital video Broadcasting.

UNIT - IV

Data Synchronization in Mobile Computing Systems **-**Synchronization, Synchronization Protocols, SyncML – Synchronization Language for Mobile Computing, Synchronized Multimedia Markup Language (SMIL). Mobile Devices, Server and Management **-**Mobile agent, Application Server, Gateways- Portals- Service Discovery- Device Management- Mobile File Systems, Security,Wireless LAN, Mobile Internet Connectivity and Personal Area Network-Wireless LAN (WiFi) Architecture and Protocol Layers-WAP 1.1 and WAP 2.0 Architectures- Bluetooth – enabled Devices Network, Zigbee.

UNIT - V

Mobile architecture- Mobile Application languages **–** XML-JAVA-Java 2 Micro Edition (J2ME)- JavaCard - Mobile Operating Systems **-** PalmOS- Windows CE- Symbian OS- Linux for Mobile Devices. Case Study.

REFERENCES

1. Raj Kamal, "Mobile Computing", Oxford University Press, 2007.
2. Asoke Talkukder, Roopa R Yavagal, "Mobile Computing – Technology, Applications and Service Creation", Tata McGraw Hill, 2007.

3. Reza B'Far, "Mobile Computing Principles – Designing and Developing Mobile Applications with UML and XML", Cambridge University press, 5th Edition, 2005.
4. Uwe Hansmann, Lothat Merk, Martin S Nicklous and Thomas Stober, "Principles of Mobile Computing", Springer International Edition, 2nd Edition, 2005.
5. Schiller, "Mobile Communication", Pearson Publication, 2004.
6. Sasu Tarkoma, "Mobile Middleware", John Wiley & Sons, 2009

CS914 INTELLIGENT INFORMATION RETRIEVAL

UNIT - I

Knowledge representation - Basics of Prepositional logic- Predicate logic-reasoning using first order logic-unification-forward chaining-backward chaining-resolution- -Production rules-frames-semantic networks- scripts.

UNIT - II

Ontology Development **-** Description logic-taxonomies-Topic maps-Ontology-Definition-expressing ontology logically-ontology representations-XML-RDF-RDFS-OWL-OIL-ontology development for specific domain-ontology engineering-Semantic web services

UNIT - III

Parallel and distributed IR- multimedia IR- data modeling-query languages-.Web Searching Basics-Characterizing the Web-Search Engines-Web crawling and in dexex-link analysis.

UNIT - IV

Information Retrieval Modeling **-** Information retrieval – taxonomy-formal characterization-classic information retrieval-set theoretic model-algebraic model-probabilistic model-structured text retrieval models-models for browsing-.retrieval performance evaluation-keyword based querying-pattern matching-structural queries-Query operations.

UNIT - V

Language models for information retrieval-text classification,Naïve bayes-vector space classification-support vector machines and machine learning on documents-flat clustering-hirarchical clustering

REFERENCES

1. Stuart Russell-Peter Norvig, "Artificial Intelligence – A modern Approach", Pearson Education, 2nd Edition,2003. (Unit I)
2. Michael c.Daconta,leo J. Obart and Kevin J Smith,"Semantic Web – A guide to the future of XML,Web Services and Knowledge Management",Wiley Publishers 2003.
3. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3rd Edition, 2003.
4. Christopher D. Manning,Prabhakar Raghavan and Hinrich Schutze, "Introduction to Information Retrieval", Cambridge University press, 2008.

CS915 REAL-TIME SYSTEMS

UNIT - I

Introduction to Real-Time system – Characteristics – Types of Real-Time tasks – Timing constraints –Real-Time Scheduling:- Basic concepts and classification of Algorithms – Clock-Driven Scheduling – Event-Driven Scheduling – Hybrid schedulers – EDF Scheduling – RM Scheduling and its Issues.

UNIT - II

Resource Sharing and Dependencies among Real-Time tasks:- Resource sharing in Real Time tasks, Priority Inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Handling Task dependencies – Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems – Resource Reclaiming in Multiprocessor Real-Time Systems – Fault-Tolerant Task Scheduling in Multiprocessor Real-Time Systems.

UNIT - III

Real-Time Operating System (RTOS):– Features of RTOS, Commercial Real-Time Operating Systems, Real-Time Databases:- Applications, Design issues, Characteristics of Temporal Data, Concurrency control, Commercial Real-Time Databases.

UNIT - IV

Real-Time Communication in Wide Area Networks:- Introduction, Service and Traffic Models and Performance Requirements, Resource Management, Switching Subsystem, Route Selection in Real-Time Wide Area Networks:- Basic Routing Algorithms, Routing during Real-Time Channel Establishment, Route Selection Approaches, Dependable Real-Time Channels

UNIT - V

Real-Time Communication in a LAN – Soft Real-Time Communication in a LAN – Hard Real-Time Communication in a LAN – Bounded Access Protocols for LANs – Real-Time Communications over Packet Switched Networks – QoS requirements – Routing and Multicasting.

REFERENCES

1. Rajib Mall, “Real-Time Systems Theory and Practice”, Pearson Education, India, 2007.
2. C. Siva Ram Murthy and G. Manimaran, “Resource Management in Real-Time Systems and Networks”, Prentice-Hall of India, 2005.

3. Jane W.S. Liu, "Real-Time Systems", Prentice Hall, USA, 2000.

CS916 WEB SERVICES AND INTERNET ENGINEERING

UNIT – I

Web Technology - Web 2.0 technologies, Introduction to Ajax, Ajax Design Basics, Introduction to WWW, TCP/IP, HTTP, ARP, ICMP FTP, UDP, routing protocols (RIP, OSPF, BGP), Network Management Protocols (SNMP), and Application-level protocols (FTP, TELNET, SMTP), URL, Web Browsers, Web Servers.

UNIT – II

Web services, Evolution and differences with Distributed computing, XML - Name Spaces - Structuring With Schemas and DTD - Transformation - XML Infrastructure WSDL, SOAP, UDDI, ebXML - SOAP And Web Services in E-Com - Overview Of .NET And J2EE.

UNIT - III

Platform for Web Services Development , MVC Design Pattern ,Web services - EJB, .NET, J2EE Architecture, J2EE Components & Containers, Specification, Application servers, Struts, Introduction to JSON.

UNIT - IV

Web Transactions, Coordination, Orchestration, and Choreography – tools BPEL, WS- CDL- Overview of Web service standards -BPEL4WS. WS-Security and the Web services security specifications, WSReliable Messaging, WS-Policy, WS-Attachments.

UNIT - V

Web Service Case Study - Web Service Search Engine, Web Service Discovery, WebService Composition. Web Service – SOAP vs Web Service – REST.

REFERENCES

1. Deitel, Deitel and Nieto, "Internet and World Wide Web – How to program", Pearson Education Publishers, 2000.
2. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 2002.
3. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2004.
4. R. Krishnamoorthy and S. Prabhu, "Internet and Java Programming", New Age International Publishers, 2004.

5. Frank. P. Coyle, "XML, Web Services and The Data Revolution", Pearson Education, 2002.
6. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.
7. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2005.

CS917 MACHINE LEARNING

UNIT - I

Introduction to Machine Learning – Applications – Learning Associations – Classification – Regression – Unsupervised Learning – Reinforcement Learning – Supervised Learning – Vapnik-Chervonenkis (VC) Dimension – Probably Approximately Correct (PAC) Learning – Noise – Learning multiple classes – Model selection and Generalization.

UNIT - II

Bayesian Decision Theory – Classification – Losses and Risks – Discriminant Functions – Utility theory – Value of Information – Bayesian Networks – Influence Diagrams – Association rules – Parametric methods – Maximum Likelyhood estimation – Bernoulli Density – Multinomial Density – Gaussian Density – Bias and Variance – Bayes' estimator – Tuning Model complexity – Model selection procedures.

UNIT - III

Multivariate methods – Parameter estimation – Multivariate Normal Distribution – Tuning Complexity – Discrete Features – Multivariate regression – Dimensionality reduction – Subset selection – Principal component analysis – Factor analysis – Multidimensional scaling – Linear discriminant analysis.

UNIT - IV

Clustering – Mixture densities – k-Means clustering – Expectation-Maximization algorithm – Hierarchical clustering – Non-parametric methods – Histogram estimator – Kernel estimator – k-Nearest neighbor estimator – Decision trees – Univariate trees – Pruning – Rule extraction from trees – Learning rules from data – Multivariate trees.

UNIT - V

Multilayer perceptions – Neural networks – perceptron – Training a perceptron – Back propagation algorithm – Local models – Competitive learning – Radial basis functions – Mixture of experts – Hidden Markov models – Discrete Markov processes – Evaluation problem – State sequence – Learning model parameters – Model selection in HMM.

REFERENCES

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.

2. Jaime Guillermo Carbonell and Tom Michael Mitchell, "Machine Learning", Morgan Kaufmann, 1994.

CS918 DATA COMPRESSION

UNIT – 1

Compression **-** Definition – lossless compression - lossy compression - modeling and coding – compression measure - Shannon's source coding and channel coding theorems – Types of redundancy - transform coding – predictive coding – simple applications.

UNIT – II

Text Compression **-** Information theory concepts – entropy - Shannon-Fano coding – Huffman coding – arithmetic coding – dictionary-based coding – LZ77 – LZ78 – LZW – BWT - context-based coding.

UNIT – III

Audio Compression **-** Basics of digital audio – audio file formats (WAV, MIDI) - ADPCM in speech coding – vocoders – LPC – CELP – MELP – scalar quantization – vector quantization – Linde-Buzo-Gray algorithm - DPCM – MPEG audio compression.

UNIT – IV

Image Compression **-** Basics of digital image – image file formats (BMP, GIF, TIFF) – Colour models in images - Discrete Fourier Transform – Discrete Cosine Transform – Discrete Wavelet Transform – Sub band coding - EZW – SPIHT – EBCOT - Image compression standards: JBIG, JPEG and JPEG 2000.

UNIT – V

Video Compression **-** Basics of digital video – video file formats – colour models in video – motion estimation and compensation - Video compression standards: MPEG-1, MPEG-2, MPEG-4, H.261, H.263 and H.264/AVC.

REFERENCES

1. David Salomon, "Data Compression: The Complete Reference," 3rd Edition, Springer International Edition, New Delhi, 2005.
2. Khalid Sayood, "Introduction to Data Compression," 2nd Edition , Harcourt India Private Ltd., New Delhi, 2000.

3. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia," Pearson Education, New Delhi, 2004.
4. Mark Nelson and Jean-Loup Gailly, "The Data Compression Book," 2nd Edition, M&T Books, New York, 1996.
5. K. R. Rao and J. J. Hwang, "Techniques and standards for image, video and audio coding," Prentice Hall Inc., New Jersey, 1996.

CS919 AGENT TECHNOLOGY

UNIT - I

Introduction to agents – Abstract architectures for intelligent agents – Concrete architecture for intelligent agents – Agent Programming languages Multi-agent Systems and societies of Agents – Agent Communications – Agent Interaction Protocols.

UNIT - II

Distributed Problem Solving and Planning – Introduction – Task Sharing – Result Sharing – Distributed Planning – Distributed Planning and Execution. Search Algorithm for Agents – Constraint satisfaction – Path finding problem – two player games.

UNIT - III

Distributed Relation Decision making – Introduction Evaluation Criteria – Voting – Auctions – Bargaining – General Equilibrium market mechanisms – Contract nets – coalition formation Learning in multi-agent system – Learning and activity coordination – Learning about and from other agents – Learning and Communication.

UNIT - IV

Computational Organization Theory – Introduction Organizational Concepts useful in modeling organizations Formal Methods in DAI – Logic based representation and reasoning.

UNIT - V

Agents Development frameworks and languages – Development tools – applications of agents. Agent Oriented methodologies – Agent oriented analysis and design, Gaia methodology, MASE, OPEN process framework, Tropos, Agent UML.

REFERENCES

1. Gerhard Weiss, "Multi-agent system – A modern approach to Distributed Artificial Intelligent", MIT press, 2000.
2. Michael Wooldridge, "Introduction to Multi-agent system", John Wiley & Sons, 2002.
3. Walter Brenner et al,,"Intelligent Software agents: Foundations and Applications", Springer Verlag. 1998

CS920 ADVANCED JAVA PROGRAMMING

UNIT - I

JAVA Basics **-** Java streaming - Networking - Event handling - Multithreading - Byte code Interpretation - Customizing application - Data Structures - Collection classes.

UNIT - II

Distributes Computing: Custom sockets - Remote Method Invocation - Activation - Object serialization -Distributed garbage collection - RMI - IIOP - Interface definition language - CORBA - JINI overview.

UNIT - III

JAVA Beans and Swing **-** Bean concepts - Events in bean box - Bean customization - Persistence - Application - deployment using swing - Advanced swing techniques - JAR file handling.

UNIT - IV

JAVA e-Applications **-** JNI - Servlets - Java Server Pages - JDBC - Session beans - Entity beans - Programming and deploying enterprise Java Beans - Java transactions.

UNIT - V

Related JAVA Techniques **-** Java Media Frame work - 3D graphics - Internationalization - Case study - Deploying n-tier application, E- commerce applications.

REFERENCES

1. Deitel,"Java How to program" , Prentice Hall , 8th Edition, 2009.
2. Gary Cornell and Cay S. Horstmann, "Core Java Vol 1 and Vol 2", Sun Microsystems Press, 1999.
3. Stephen Asbury, Scott R. Weiner and Wiley, "Developing Java Enterprise Applications", 1998.

CS921 OPTICAL COMMUNICATION NETWORKS

UNIT - I

Introduction to optical networks – Principles of optical transmission – Evolution of optical networks – Components and enabling technologies – Wavelength division multiplexing (WDM) – WDM network architectures, broadcast-and-select networks, linear lightwave networks, and wavelength routed networks – Issues in broadcast-and- Select networks.

UNIT - II

Static traffic routing in wavelength routed networks – Virtual topology design – problem formulation and algorithms - design of multi-fiber networks – Virtual topology reconfiguration – problem formulation - reconfiguration due to traffic changes - reconfiguration for fault restoration – Network provisioning.

UNIT - III

Dynamic traffic routing in wavelength routed networks – Routing and wavelength assignment algorithms – Centralized and distributed control – Introduction to Wavelength convertible networks – Wavelength rerouting.

UNIT - IV

Control and Management – Functions – Framework – Information Model – Protocols – Optical layer Services and Interfacing – Network Survivability – Protection in SONET/ SDH – Protection in IP Networks – Optical Layer Protection – Schemes.

UNIT - V

Next generation optical Internets – burst switching – packet switching (IP-over-WDM) – Multicast traffic routing – source rooted trees - Access Networks – PON, FTTC, FTTH.

REFERENCES

1. B. Mukherjee, “Optical Communication Networks”, McGrawHill, 1997 (UNIT I)
2. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective”, 2nd Edition, Morgan Kaufmann (Elsevier Indian Edition), 2004. (Units IV and V).
3. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design, and Algorithms”, PHI, 2002. (Units I, II, III, and V)

CS922 SOFTWARE ARCHITECTURE

UNIT - I

Software Architecture - Bridging Software Requirement and Software Implementation-Architectural Styles-Quality Attributes-Guidelines for Software Architectural Design. Software Architecture Design Space **-** Types of Software Structures-Software Elements-Software Connectors-An Agile Approach to Software Architecture Design. Models for Software Architecture - UML for Software Architecture-Architecture Views-Architectural Description Languages (ADL).

UNIT - II

Object Oriented Paradigm **-** Introducing Object Oriented Paradigm -OO Analysis-OO Design-Design Principles. Data Flow Architecture - Batch Sequential-Pipe & Filter Architecture-Process-Control Architecture. Data Centered Software Architecture **-** Repository Architecture Style-Blackboard Architecture Style.

UNIT - III

Hierarchy Architecture **-** Main/Subroutine-Master/Slave-Layered-Virtual Machine. Implicit Asynchronous Communication Software Architecture **-** Non-Buffered Event-Based Implicit Invocations-Buffered Message-Based Software Architecture. Interaction Oriented Software Architecture **-** Model-View-Controller (MVC)-Presentation-Abstraction-Control (PAC).

UNIT - IV

Distributed Architecture - Introduction-Client/Server-Multi-tiers-Broker Architectural Style-Service-Oriented Architecture (SOA). Component-Based Software Architecture - Component-Principles of Component-Based Design. Heterogeneous Architecture **-** Methodology of Architecture Decision-Quality Attributes-Selection of Architectural Styles-Evaluation of Architecture Designs-Case Study: Online Computer Vendor.

UNIT - V

Architecture of Graphical User Interfaces **-** Evolution of User Interfaces -Look-and-Feel (Syntax) of User Interfaces-Usability (Semantics) of User Interfaces-Design Considerations of User Interfaces-Enabling Technology-Direct Manipulation-Evaluation of

User Interfaces. Product Line Architectures **-** Introduction and Motivation-Domain Engineering: Institutionalizing Software Reuse-Product Line Architectures (PLA)-A Product Line Analysis Example.

REFERENCES

1. Kai Qian, Xiang Fu, Lixin Tao, Chomg-Wei Xu and Jorge L. Diaz-Herrera, "Software Architecture and Design Illuminated", Jones & Bartlett Publishers, 2010.
2. Mary Shaw and David Garlan, "Software Architecture: Perspectives on an emerging discipline", Prentice Hall of India, 2010.

CS923 ADVANCES IN SOFTWARE ENGINEERING

UNIT - I

Review of software development techniques: Life cycle models: water fall, prototyping, rapid application development, spiral model, component based model. Development Approach: Object oriented Analysis and Design – Artifacts.
Introduction to Patterns - Application of Paaterns

UNIT - II

Measurement and Experimentation: Introduction- the basics of measurement-goal based frame work for measurement-empirical investigation-software metrics data collection – analyzing software measurement data.

UNIT - III

Agile and Iterative Development: Introduction-Iterative and Evolutionary-agile-motivation-Scrum-Extreme Programming-Unified Process.

UNIT - IV

Distributed Software Engineering: Distributed systems issues- Client—server computing-Architectural patterns for distributed systems-Software as a service.
Service-oriented Architecture- Services as reusable components-Service engineering-Software development with services.
Embedded Systems: Embedded systems design- Architectural patterns-Timing analysis. Real time operating systems.

UNIT - V

Web engineering: An introduction to web engineering-Requirements engineering for web application-Modeling web applications-web application architecture-technology aare web application Design –Testing web application-web application development process-performance of web applications

REFERENCES

1. Ian Sommerville, "Software Engineering", 9th Edition, 2010, University of St Andrews, Scotland. [UNIT I and IV]
2. Dan Pilone and Neil Pitman, "UML 2. 0 In A Nutshell", Shroff/o'reilly publisher, 2005. [UNIT I]
3. Craig Larman, "Agile and Iterative Development: AManager;s Guide" Pearson Education 2009. [UNIT IV]
4. Gerti Kappel, Brigit Proll,Siegfried Reich and Werner Retschitzegger, "Web Engineering", Wiley India 2009. [UNIT V]

CS924 SYSTEMS PERFORMANCE EVALUATION

UNIT - I

The art of performance evaluation – Professional organizations, journals, and conferences - Performance Projects – Common Mistakes in Performance Evaluation – A systematic approach to Performance Evaluation – Selection of techniques – Performance metrics - Utility classification – Setting performance requirements.

UNIT - II

Types of workloads – Instruction mixes – Kernels – Synthetic Programs – Application Benchmarks – Art of Workload selection - services exercised – level of detail – Representativeness – Timeliness – Other considerations in Workload selection - Workload Characterization Techniques – Terminology – Averaging – Specifying Dispersion – Single-Parameter and Multi parameter Histograms – Principal-Component Analysis – Markov models – Clustering.

UNIT - III

Monitors – Terminology – Classifications – Software and Hardware Monitors – Firmware and Hybrid Monitors – Distributed-System Monitors – Program Execution Monitors – Accounting Logs – Analysis and Interpretation of log data – Capacity Planning and Benchmarking – Load Drivers – Remote-Terminal Emulation –Art of Data Representation – Guidelines for preparing good graphical charts – Gantt Charts – Kiviat Charts – Schumacher Charts.

UNIT - IV

Summarizing Measured Data – Basic Probability and Statistics Concepts – Geometric Mean – Harmonic Mean – Mean of a Ratio – Index of Dispersion – Determining Distribution of Data - Sample versus Population – Confidence Interval for the Mean – Testing for a Zero mean - Hypothesis Testing versus Confidence Intervals – Confidence Intervals for Proportions – Determining Sample Size.

UNIT - V

Linear Regression Models – Distributions: Bernoulli, Binomial, Chi-Square, Exponential, Geometric, Normal, Pareto, Poisson, Student's t, Continuous and Discrete Uniform – Relationships among distributions – Queuing Theory – Notation – Rules – Little's Law –

Birth-Death Processes – M/M/1, M/M/m, M/M/m/B queues – Queuing Network Models for Computer Systems.

REFERENCES

1. R.K.Jain, "The Art of Computer Systems Performance Analysis – Techniques for Experimental Design, Measurement, Simulation, and Modeling", Wiley-India, 2008.
2. R.Pannerselvam, "Research Methodology", PHI, 2004.

CS925 DISTRIBUTED ALGORITHMS

UNIT – I

Introduction to Distributed Algorithms, Kinds of Distributed Algorithm, Timing Models. Synchronous Network Algorithms: Synchronous Network Model, Leader Election in a synchronous Ring, Algorithms in a General Synchronous Networks, Distributed Consensus with Link Failures, Distributed Consensus with Process failures, More Consensus problems.

UNIT – II

Asynchronous Algorithms: Asynchronous System Model. Asynchronous Shared Memory Algorithms: Asynchronous Shared Memory Model; Mutual Exclusion, Resource Allocation; Consensus; Atomic Objects.

UNIT – III

Asynchronous Network Algorithms: Asynchronous Network Model; Basic Asynchronous Network Algorithms, Synchronizers, Shared Memory versus Networks, Logical Time, Global Snapshots and Stable properties.

UNIT – IV

Network Resource Allocation: Mutual Exclusion, General Resource Allocation. Asynchronous Networks with Process Failures: The Network Model, Impossiblity of Agreement in the presence of Faults, A Randomized Algorithm, Failure Detectors, k-Agreement, Approximate Agreement. Data Link Protocols: The Problem, Stenning's Protocol, alternating Bit Protocol, Bounded Tag protocols tolerating Reordering, Tolerating Crashes.

UNIT – V

Partially Synchronous Algorithms: Partially Synchronous System Models: MMT and General Timed Automata, Properties and Proof methods, Modeling Shared Memory and Network Systems. Mutual Exclusion with Partial Synchrony: A single-register algorithm, Resilience to Timing Failures, Impossibility Results. Consensus with partial Synchrony: A Failure Detector, Basic Results, An Efficient algorithm.

REFERENCES

1. Nancy A. Lynch, "Distributed Algorithms", Morgan Kaufmann Publishers, 2000.

2. Geral Tel, "Introduction to Distributed algorithms", 2nd Edition, Cambridge, 2004.

3. Nicola Santoro, "Design and Analysis of Distributed Algorithms", Wiley-Interscience, John Wiley & Sons, Inc., Publication, 2007.

CS926 DATA MINING AND DATA WAREHOUSING

UNIT – I

Relation to statistics, databases, machine learning - Taxonomy of data mining tasks - Steps in data mining process - Overview of data mining techniques.

UNIT - II

Visualization and statistical perspective Visualization - Dimension reduction techniques - Data summarization methods - Statistical Perspective - Probabilistic - Deterministic models - Clustering - Regression analysis - Time series analysis - Bayesian learning.

UNIT - III

Predictive modeling - Predictive Modeling - Classification - Decision trees - Patterns - Association rules - Algorithms.

UNIT - IV

DATA WAREHOUSING: Design - Dimensional Modeling - Meta data - Performance issues and indexing -VLDB issues - Development life cycle - Merits.

UNIT - V

APPLICATIONS: Tools - Applications - Case Studies.

REFERENCES

1. Usama M.Fayyad, Geogory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Morgan Kauffmann Publishers, 2000.
3. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
4. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997.

5. Bharat Bhushan Agarwal and Sumit Prakash Tayal, "Data Mining and Data warehousing", Laximi Publications Ltd., 2009

CS927 MULICORE ARCHITECTURE AND PROGRAMMING

UNIT - I

Fundamentals of SuperScalar Processor Design, Introduction to Multicore Architecture – Chip Multiprocessing, homogeneous Vs heterogeneous design - SMP – Multicore Vs Multithreading. Shared memory architectures– synchronization – Memory organization – Cache Memory – Cache Coherency Protocols - Design of Levels of Caches.

UNIT - II

Multicore programming Model – Shared memory model, message passing model, transaction model – OpenMP and MPI Programming. PowerPC architecture – RISC design, PowerPC ISA, PowerPC Memory Management - Power 5 Multicore architecture design, Power 6 Architecture.

UNIT - III

Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element), Cell Software Development Kit, Programming for Multicore architecture.

UNIT - IV

PRAM Model – PRAM Algorithms – Parallel Reduction – Prefix Sums – List Ranking – Preorder Tree Traversal – Merging Two Sorted Lists – Graph Coloring – Reducing Number of Processors – NC Class. Classifying MIMD Algorithms – Hypercube SIMD Model – Shuffle Exchange SIMD Model – 2D Mesh SIMD Model – UMA Multiprocessor Model – Broadcase – Prefix Sums. Enumeration Sort – Lower Bound on Parallel Sorting – Odd-Even Transposition Sort –Bitonic Merge – Parallel Quick Sort – Complexity of Parallel Search – Searching on Multiprocessors.

UNIT - V

P-Depth Search – Breadth Death Search – Breadth First Search – Connected Components – All pair Shortest Path – Single Source Shortest Path – Minimum Cost Spanning Tree. Matrix Multiplication on 2-D Mesh, Hypercube and Shuffle Exchange SIMD Models – Algorithms for Multiprocessors – Algorithms for Multicomputers – Mapping Data to Processors.

REFERENCES

1. Hennessey and Pateterson, "Computer Architecture A Quantitative Approach", Harcourt Asia, Morgan Kaufmann, 1999.

2. Joseph JaJa, "Introduction to Parallel Algorithms", Addison-Wesley, 1992.
3. Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability and Programmability" McGraw-Hill, 1993.
4. Richard Y. Kain, "Advanced Computer Architecture: A System Design Approach", PHI, 1999.
5. Rohit Chandra, Ramesh Menon, Leo Dagum, and David Kohr, "Parallel Programming in OpenMP", Morgan Kaufmann, 2000.
6. Michael J. Quinn, "Parallel Computing: Theory & Practice", Tata McGraw Hill Edition, 2003.
7. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", 2nd Edition, Addison Wesley, 2003.

CS928 AD HOC AND SENSOR NETWORKS

UNIT - I

Introduction to Wireless Networks – Evolution of 3G Mobile Systems – Wireless LANs – Bluetooth – Scatternet – Piconet - Ad hoc Networks – Heterogeneity in Mobile Devices – Types of Ad hoc Mobile Communications – Types of Mobility – Challenges in Ad hoc Mobile Networks – Energy Management - Scalability – Addressing and Service Discovery - Deployment Considerations.

UNIT - II

MAC protocols for Ad hoc Networks: Design issues – Classifications – Contention based protocols – MACAW – FAMA – BTMA – DBTMA - MACABI – Real-Time MAC protocol – Multichannel protocols – Power aware MAC – Routing protocols: Design issues – Table-driven protocols – DSDV – WRP – CGSR – On-Demand protocols – DSR – AODV – TORA – LAR – ABR – Zone Routing Protocol – Power Aware Routing protocols.

UNIT - III

Multicast Routing – Preferred Link based Multicast – Mesh-based protocols – Core-Assisted Mesh protocol - Issues in Transport layer protocols – TCP over Ad hoc Networks – TCP Reno – Tahoe – Vegas – TCP SACK – Indirect TCP – Snooping TCP - Split-TCP – TCP-BuS – Quality of Service issues – MAC layer solutions – Network layer solutions – QoS framework for Ad hoc networks – INSIGNIA – INORA – SWAN.

UNIT - IV

Wireless Sensor Networks – Unique constraints and challenges - Applications – Collaborative processing – Architecture – Data Dissemination – MAC protocols – S-MAC – IEEE 802.15.4 and ZigBee – Geographic, Energy-Aware Routing – Attribute-based routing – Directed Diffusion – Rumor Routing - Geographic Hash Tables -GHT – Data Gathering – PEGASIS – Location Discovery – Localization – Communication and Sensing Coverage.

UNIT - V

Topology Control – Time Synchronization - Sensor Taking and Control – Sensor Selection – IDSQ – Cluster Leader-based Protocol – Joint Routing and Information Aggregation – Sensor Network Databases – Challenges – In-Network Aggregation – TinyDB query processing – Data-Centric Storage – Data Indices and Range Queries – Distributed Hierarchical Aggregation – Temporal Data – Platforms and Tools – Berkeley Motes – Programming Challenges – TinyOS – nesC – TinyGALS – ns2 extensions – TOSSIM – Actuators.

REFERENCES

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Education, 2007.
2. C. K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Pearson Education, 2007.
3. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks: An Information Processing Approach", Morgan Kaufman Publishers, 2007.
4. Jochen Schiller, "Mobile Communications", Pearson Education, 2009.

CS929 REINFORCEMENT LEARNING

UNIT - I

Reinforcement Learning (RL) – Introduction – Examples – Elements of RL - Tic-Tac-Toe example – History of RL – Evaluative Feedback – An n-armed bandit problem – Action Value Methods – Softmax action selection – Evaluation Versus Instruction – Incremental Implementation – Tracking a nonstationary problem – Optimistic initial values – Reinforcement Comparison – Pursuit Methods – Associative Search.

UNIT - II

The RL problem – Agent-Environment Interface – Goals and Rewards – Returns – Unified Notation for Episodic and Continuing Tasks – The Markov Property – Markov Decision Processes – Value Functions – Optimal Value Functions – Optimality and Approximation.

UNIT - III

Dynamic Programming – Policy Evaluation – Policy Improvement – Policy Iteration – Value Iteration - Asynchronous Dynamic Programming – Generalized Policy Iteration – Efficiency of Dynamic Programming – Monte Carlo Methods – Monte Carlo Policy Evaluation – Monte Carlo Estimation of Action Values – Monte Carlo Control.

UNIT - IV

On-policy Monte Carlo Control – Evaluating one policy while following another – Off-policy Monte Carlo – Incremental Implementation – Temporal-Difference Learning – TD prediction – Advantages of TD prediction methods – Optimality of TD(0) – Sarsa: On-policy TD control – Q-Learning: off-policy TD control – Actor Critic Methods.

UNIT - V

Eligibility Traces – n-step TD prediction – forward and backward view of TD – Sarsa and Q – Eligibility traces for actor critic – Value prediction with function approximation – Gradient-Descent Methods – Coarse Coding – Tile Coding – Case Studies: TD-Gammon – Elevator Dispatching - Dynamic Channel Allocation – Job-Shop Scheduling.

REFERENCES

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning – An Introduction", MIT press, 1998.
2. Busoniu L, Robert. B, Bart De Schutter, and Damien Ernst, "Reinforcement Learning and Dynamic Programming using Function Approximators", Taylor & Francis CRC Press, 2010.

CS930 DESIGN OF EMBEDDED SYSTEMS

UNIT - I

Embedded Computing - Challenges of Embedded Systems – Embedded system design process. Embedded processors – ARM processor – Architecture, ARM and Thumb Instruction sets

UNIT - II

Embedded C Programming **-** C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

UNIT - III

Optimizing Assembly Code **-** Profiling and cycle counting – instruction scheduling – Register allocation – conditional execution – looping constructs – bit manipulation – efficient switches – optimized primitives.

UNIT - IV

Processes and Operating systems **-** Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Exception and interrupt handling - Performance issues.

UNIT - V

Embedded System Development **-** Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design methodologies – Case studies – Windows CE – Linux 2.6x and RTLinux – Coding

and sending application layer byte stream on a TCP/IP network using RTOS Vxworks – Embedded system for a smart card.

REFERENCES

1. Andrew N Sloss, D. Symes and C. Wright, "ARM System Developers Guide", Morgan Kaufmann / Elsevier, 2006.
2. Michael J. Pont, "Embedded C", Pearson Education, 2007.
3. Wayne Wolf, "Computers as Component: Principles of Embedded Computer System Design", Morgan Kaufmann / Elsevier, 2nd Edition, 2008.
4. Steve Heath, "Embedded System Design", Elsevier, 2nd Edition, 2003.
5. Raj Kamal, "Embedded Systems – Architecture, Programming and Design", 2nd Edition, McGraw-Hill companies, 2008

CS931 SERVICE ORIENTED ARCHITECTURE

UNIT - I

Fundamental SOA-Common characteristics of contemporary SOA- Common misperceptions about SOA-Common tangible benefits of SOA- Common pitfalls of adopting SOA - An SOA timeline The continuing evolution of SOA - The roots of SOA (comparing SOA to past architectures). The Web services framework- Services Service descriptions (with WSDL)-Messaging

UNIT - II

Web Services and Contemporary SOA **-** Message exchange patterns- Service activity-coordination-Atomic transactions- Business activities-Orchestration-Choreography- Issues **-** Addressing- Reliable messaging- Correlation-Policies- Metadata exchange- Security-Notification and eventing.

UNIT - III

Principles of Service-Orientation-Service-orientation and the enterprise- Anatomy of a service-oriented architecture- Common principles of service-orientation- How service-orientation principles inter-relate-Section-Service-orientation and object-orientation- Native Web service support for service-orientation principles. Service Layers -Service-orientation and contemporary SOA- Service layer abstraction-application service layer-Business service layer- Orchestration service layer-Agnostic services- Service layer configuration scenarios.

UNIT - IV

Building SOA **-** SOA Delivery Strategies- SOA delivery lifecycle phases- The top-down strategy- The bottom-up strategy- The agile strategy. Introduction to service-oriented analysis- Benefits of a business-centric SOA- Deriving business services-Service Modeling - Service modeling -Service modeling guidelines- Classifying service model logic- Contrasting service modeling approaches

UNIT - V

Service-Oriented Design **-** Introduction to service-oriented design- WSDL-related XML Schema language basics- WSDL language basics- SOAP language basics- Service interface design tools. SOA Composition Guidelines **-** Steps to composing SOA-Considerations for choosing service layers and SOA standards, positioning of cores and SOA extensions. Service Design -Overview-Service design of business service, application service, taks centric service and guidelines. Business Process Design - WS-BPEL language basics-WS-Coordination overview- Service-oriented business process design

REFERENCES

1. Thomas Erl ," Service-Oriented Architecture: Concepts, Technology & Design", Pearson Education Pte Ltd, 2008.
2. Thomas Erl, "SOA Principles of Service Design", Pearson Exclusives, 2007.
3. Tomas Erl and Grady Booch, "SOA Design Patterns", Prentice Hall, 2008.

CS932 DISTRIBUTED SYSTEM SECURITY

UNIT – I

Introduction – Distributed Systems, Distributed Systems Security. Security in Engineering: Secure Development Lifecycle Processes - A Typical Security Engineering Process - Security Engineering Guidelines and Resources. Common Security Issues and Technologies: Security Issues, Common Security Techniques.

UNIT – II

Host-level Threats and Vulnerabilities: Transient code Vulnerabilities - Resident Code Vulnerabilities - Malware: Trojan Horse – Spyware - Worms/Viruses – Eavesdropping - Job Faults. Infrastructure-Level Threats and Vulnerabilities: Network-Level Threats and Vulnerabilities - Grid Computing Threats and Vulnerabilities – Storage Threats and Vulnerabilities – Overview of Infrastructure Threats and Vulnerabilities.

UNIT - III

Application-Level Threats and Vulnerabilities: Application-Layer Vulnerabilities -Injection Vulnerabilities - Cross-Site Scripting (XSS) - Improper Session Management - Improper Error Handling - Improper Use of Cryptography - Insecure Configuration Issues - Denial of Service - Canonical Representation Flaws - Overflow Issues. Service-Level Threats and Vulnerabilities: SOA and Role of Standards - Service-Level Security Requirements - Service-Level Threats and Vulnerabilities - Service-Level Attacks - Services Threat Profile.

UNIT - IV

Host-Level Solutions: Sandboxing – Virtualization - Resource Management - Proof-Carrying Code -Memory Firewall – Antimalware. Infrastructure-Level Solutions: Network-Level Solutions - Grid-Level Solutions - Storage-Level Solutions. Application-Level Solutions: Application-Level Security Solutions.

UNIT - V

Service-Level Solutions**:** Services Security Policy - SOA Security Standards Stack – Standards in Dept - Deployment Architectures for SOA Security - Managing Service-Level Threats - Compliance in Financial Services **-** SOX Compliance - SOX Security Solutions - Multilevel Policy-Driven Solution Architecture - Case Study: Grid **-** The Financial Application **-** Security Requirements Analysis. Future Directions **-** Cloud Computing Security **–** Security Appliances **-** Usercentric Identity Management **-** Identity-Based Encryption (IBE) **-** Virtualization in Host Security.

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1. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, Srinivas Padmanabhuni and Srikanth Sundarrajan, "Distributed Systems Security: Issues, Processes and Solutions", Wiley Pubilications. 2009.
2. Yang Xiao and Yi Pan,"Security in Distributed And Networking Systems", World Scientific Publishing Company, 2007.
3. Rachid Guerraoui and Franck Petit "Stabilization, Safety, And Security Of Distributed Systems", Springer, 2010.

CS933 TRUSTED INTERNET

UNIT - I

Introduction: Understanding the Internet's underlying architecture, connecting to the internet, Internet Service Providers (ISP), TCP/IP Suite and Internet Stack Protocols, Web Client Server Architecture, Internet Security Evolution.

UNIT - II

Internet Security: Security Issues, Real Threats that Impact Security, Securing the Web Client - Protecting Web Browser, Enhancing Web server security - Controlling Access, Extended Web Site Security Functionality, Securing Web Communications with SSL, VPNS.

UNIT - III

Trusted Systems and Security Policies: Trusted System Design, Trusted OS, Secure System Models, Security in Networks: Network Security Controls, IDS, Firewalls, Secure E-Mail. Internet Security Policies: Web Server and Web Browser policies.

UNIT - IV

E-Commerce Security: SET for E- Commerce Transactions, Business requirements for SET, SET System Participants, Dual Signature and Signature, Authentication and Message Integrity, Payment Processing.

UNIT - V

Secure Internet Programming, Security development life cycle, Internet Security Standards and Internet Security Products, Trusted Internet Security services.

REFERENCES

1. Charles P.Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", Pearson Education Pvt Ltd, 4th Edition, 2006.
2. Man Young Rhee, "Internet Security Cryptographic Principles, Algorithms and Protocols", John Wiley & Sons Ltd, 2003.
3. John R. Vacca, "Practical Internet Security", Springer, 2007.
4. Preston Gralla, Michael Troller, "How the Internet Works", Que Publishers, 8th Edition.

CS934 ETHICAL HACKING

UNIT - I

Casing the Establishment **-**footprinting- Internet Footprinting. -Scanning-Enumeration **-** basic banner grabbing, Enumerating Common Network services. Case study- Network Security Monitoring.

UNIT - II

Securing permission **-** Securing file and folder permission. Using the encrypting file system. Securing registry permissions. Securing service - Managing service permission. Default services in windows 2000 and windows xp**.** Unix **-** The Quest for Root. Remote Access vs Local access. Remote access. Local sccess. After hacking root.

UNIT - III

Dial-up, PBX, Voicemail, and VPN hacking **-** Preparing to dial up. War-Dialing. Brude-Force Scripting PBX hacking.Voice mail hacking. VPN hacking. Network Devices – Discovery, Autonomous System Lookup. Public Newsgroups. Service Detection.Network Vulnerability. Detecting Layer 2 Media.

UNIT - IV

Wireless Hacking - Wireless Footprinting. Wireless Scanning and Enumeration. Gaining Access. Tools that exploiting WEP Weakness. Denial of Services Attacks. Firewalls**-** Firewalls landscape- Firewall Identification-Scanning Through firewalls- packet Filtering-

Application Proxy Vulnerabilities . Denial of Service Attacks **:** Motivation of Dos Attackers. Types of DoS attacks. Generic Dos Attacks. Unix and Windows DoS.

UNIT - V

Remote Control Insecurities **-** Discovering Remote Control Software. Connection. Weakness.VNC . Microsoft Terminal Server and Citrix ICA. Advanced Techniques - Session Hijacking. Back Dorrs. Trojans. Cryptography. Subverting the systems Environment. Social Engineering. Web Hacking. Web server hacking web application hacking. Hacking the internet User **-** Malicious Mobile code. SSl fraud-mail Hacking. IRC hacking, Global countermeasures to Internet User Hacking.

REFERENCES

1. Stuart McClure, Joel Scambray and Goerge Kurtz, “Hacking Exposed Network Security Secrets & Solutions”, Tata McGraw-Hill Publishers, 2010.
2. Bensmith, Brian Komer, “Microsoft Windows Security Resource Kit”, Prentice Hall of India, 2010.

Infrastructure and Faculty requirements for M.Tech(CSE-DCS)

Faculty–student ratio: **1:12** (As per AICTE norms for intake of 25: 1 Professor, 1 Associate Professor, 2 Assistant Professors)

Class room Equipment: Multimedia Projector, Black Board

Teacher qualification Specialization : M.Tech. in Computer Science and Engineering

Class Room: 1 area of 30 sq.m

Laboratory: 1

Resource	**Batch size of 25 students**
Computer System Server	1 No.
Computer systems node	25 No connected in LAN
UPS	Minimum of 5 KVA
Printer	2 No.
User License required for software (proprietary)	Minimum 25 No.
Software	1. Microsoft Server OS/ Linux Server OS/ UNIX Server OS/Any open source server OS / any Proprietary Server OS software[2] 2. Proprietary/ open source clientS 3. Borland C Compiler / Microsoft C compiler/ any open source C compiler/ any Proprietary C compiler 4. Java development Kit (Latest Version) 5. Microsoft Visual Studio With .Net Framework 6. DB2 Server / ORACLE server/ SQL Server/ Open source DBMS server software 7. Network simulator 8. Open MP